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Eye Exercises—Do They Do Any Good? Do They Do Any Harm? Their Limitations

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THE author presents the "debit" and the "credit" sides of eye exercises.

IT IS not necessary to be a doctor to realize that exercises, practice, repetition, doing a thing over and over under competent supervision, are the universal means by which one learns, and are not limited to a few branches of learning. The child learns to write, to draw, to play a musical instrument, to play games, to wrestle, to fight, to sing. The surgeon makes use of exercises to cure defects and deformities: flat feet, crooked backs, weak muscles.

Dual Function of Exercises

Exercises are used to develop skill and to increase muscular strength, sometimes both. But they are not limited to things requiring muscular activity—motor functions. The same principle applies to sensory functions. The young violinist has to learn to use the fingers of his left hand on the strings and to use his right hand and arm to manage the bow, but it is indispensable that he learn to tune the instrument and that he learn so to place his finger tips as to produce the correct pitch and that is a matter of training the ear, that is, hearing, and of co-ordinating fingers and ears. The tea taster has to learn by practice, has to train and develop his sense of taste and smell.

The student of art in learning to appreciate painting, has to train his eye, has to develop his ability to see. This is done by practice under competent teachers. The sailor has to learn to

recognize different vessels and different airplanes. The hunter has to learn to see things in the woods.

One of the most fundamental laws of biology is that repetition of an act facilitates its performance. The first time one does something it may be done clumsily and laboriously, the hundredth or the thousandth time it may be done dexterously, and with ease.

If the act involves muscular action, as most acts do, one result of practice, repetition, exercise, is that the muscles involved increase in size and power (hypertrophy)—become stronger. For example, in learning to row, two things are involved, skill in handling the oars, and strong enough muscles to do the work required. If the muscles are already strong enough, no increase in strength results from the exercise—only increase in skill. In exercises at the piano, it is not stronger muscles that are the aim, but skill in using the muscles.

Thus, one can think of the muscles and the nerves and the nerve centers in the brain and spinal cord as constituting a *neuro-muscular mechanism*. Sometimes the main thing is developing stronger muscles for a particular act but far more frequently it is the *neuro* part of the neuro-muscular mechanism that requires developing. We shall see how important that is in developing vision—ability to see, to use the eyes.

Seeing—Half Ocular, Half Mental

Seeing can be analyzed into several parts. First, an image of the object looked at is formed on the retina. Second, the eyes must be moved so that the images on the two retinas fall on the most sensitive parts of the two retinas so that one can see the object most distinctly (*fixation*, often erroneously called focusing) and so that the image of one eye blends or fuses with that of the other eye (*binocular vision*). Third, the image must be focused so that it is sharp and well-defined, not blurry; this is done by the accommodation. The result is a sensation—two sensations in fact, one for each eye. This is the first step in seeing. But it is only the first step. Its importance is greatly overstressed. The reason its importance is overemphasized is that defects in this part of the act of seeing can be helped by glasses. As a matter of fact, eye specialists devote most of their time to correcting certain common defects

of this kind (myopia, hypermetropia, astigmatism, presbyopia, heterophoria). Hence it is not to be wondered at that they emphasize the importance of this part of the visual function—the ocular or physical part.

The Brain in Seeing

The second and equally important step in seeing is this: the sensations must reach consciousness and become perceptions. It has been thoroughly established that it is impossible to experience a pure, isolated sensation. There are two factors which affect all sensations as they reach consciousness and become perceptions. In the first group are all those other sensations coming into consciousness at the same time not only through the visual apparatus but also through auditory, tactile, kinesthetic and all other avenues. The second group comprises memories of past experiences and even inherited predispositions. A mere glimpse, perhaps in a dim light, of an object well-known from previous experience results in "seeing" many details which as a matter of fact are supplied by memory, though quite unconsciously and automatically. A familiar figure is dimly seen at twilight walking with a child and a dog across the street. The woman is heard to call the dog and the familiar voice confirms the inadequate sight and details are supplied by memory; details which include the hat and dress of the woman and of the child, the color and coat of the dog, etc.

Consider the use of the eyes in reading. When a beginner reads, words have to be looked at letter by letter until they have become familiar as whole units (some methods of teaching require the pupil to learn words as units and not spell them out letter by letter even at the beginning). A new language finds even the expert reader adopting the beginner's method of spelling out the unfamiliar words. Eventually, the expert reader does not even "see" or look at single words, let alone the individual letters of each word, but he scans the lines of words with several fixation pauses of 0.2 to 0.3 seconds duration, and with very rapid movement (0.02 to 0.03 seconds) from one fixation to the next. Because he comprehends what he is reading he needs to catch only a word here and there and *his mind supplies the rest.* And yet the expert proofreader will detect a misspelled word or error of punctuation or other defect

because something about the word or words does not fit the mental picture (the memory picture) with which it is incessantly being compared.

Thus, learning to read involves among other things (such as acquiring a vocabulary of the language being read) chiefly storing up memories, mental pictures of words and phrases which a mere glance at the printed line suffices to recall. One may silently or even audibly form the words with his lips to aid the visual impression by the vocal and auditory memories of the same words.

Notice that from the factor of experience (memory) arises the ability to complete a pattern from incomplete data. Then there is the "rectifying capacity" by which an image of a ring held tilted at an angle so that it forms an elliptical image on the retina is perceived as a circle, not an ellipse; or a square card tilted so that its image on the retina is not square is nevertheless perceived as a square.

Determining Results of Eye Exercises

Before taking up specific examples of the effect of eye exercises, there is one important question to be answered. How is one to determine the results? There are two ways. The commonest and most important measure of visual performance (of seeing) is the Snellen test. This consists of a chart with letters or other characters of different sizes arranged in rows. Each row is marked with a number which is the distance at which the letters in that row can be read by a person with standard normal vision. If feet are used, the lines are, for example, 10, 12, 15, 20, 30, 40, 60, 100; or if the metric system is used, the lines are 3 meters, 4 ,5, 6, 8, 10, 12, 15, 20, and so on. The usual distance for testing is 6 meters. If the subject at 6 meters can read the line marked 5, his vision is 6/5, if he can read no more than the line marked 12, his vision = 6/12, etc. When proper precautions are observed, this gives a fairly dependable measure of the ability to distinguish small objects called "visual acuity" (abbreviated as V.). It is not the sole method of measuring visual functions. There are other things to be considered besides visual acuity, such as color sense, binocular vision (often referred to as muscle testing) stereoscopic depth perception and

others. It is not necessary to take these up in detail. *All these tests aim to measure in scientific standard units.*

There is another way to estimate the results and that is to ask the patient whether he sees better, uses his eyes more easily and with less discomfort, etc.

The two methods do not always agree. For example, some years ago a young ophthalmologist was sent to Europe to investigate the methods used by quacks and others in treating cataracts without operating. He returned to New York and proceeded to try out these methods on a hundred patients at the Clinic. After a year of careful following out of the treatment, the patients were asked if they had improved and nearly all said they had and wished to continue. But the ability to see had been carefully recorded at the beginning of the treatment, from time to time during the treatment, and at the end. The sad facts were that the vision was rather worse than at the beginning. The cataracts had continued to progress in spite of the treatment. The impression of the patient was a quite misleading guide to the actual result.

It will be enlightening to apply these methods to a few cases where eye exercises or eye-sight training have been used. In that way one can evaluate claims made by advocates of various methods of training or treatment by exercises.

Speed of Reading Improved by Exercises

The speed with which a number of digits or letters are seen can be greatly improved by training and can be measured accurately. Renshaw reported work on the Polish lightning calculator, Dr. Finkelstein, who memorized: 8 digits in .003 seconds; 12 digits in .824 seconds; 16 digits in 1.73 seconds.

Renshaw then trained a dozen university students, two of whom were able, after practice, to surpass Finkelstein's record for speed in learning digit groups. He remarks: "The difference between the expert and the novice in the rapid and accurate perception of visual material is the same difference between the expert and the novice in the performance of any skillful act. We have to learn to see just as we have to learn to swim, to play the piano, or to speak French. This can be done with skill and efficiency or it can be done haltingly and ineffectively. When we train children to learn to

spell English words by replacing the wasteful and ineffective disjunctive method of seeing words with the proper method of visual perception, spelling difficulties disappear. Not only does a child spell accurately and easily, but he comes to enjoy spelling. An incidental by-product also is that his rate of reading and index of comprehension automatically show a corresponding improvement."

Color Blindness Erroneously Thought Improved

Treatment for color blindness in men rejected from military service has been advocated. Color blindness *can* be measured by accurate laboratory tests. It is *usually* measured in the military services by a test which is sufficiently accurate for most purposes but which can be circumvented by practice. In other words, a candidate though still color blind (it is a congenital incurable condition) can learn to pass the test. This test consists of a number of plates called pseudo-isochromatic, designed by Ishihara. The plates consist of a large number of small colored discs of many tints closely packed and apparently irregularly distributed over the page all mixed up. To a normally sighted person, the distribution is not haphazard but there is a large numeral easily distinguished because the tiny discs of which it is made differ in tint from the surrounding spots of color. To a color blind person, the figure is not visible because the spots of color of which it is made do not appear to his eyes sufficiently different from those surrounding it to make a contrast. The American Optical Company has published a set of plates, 46 in number, all different and cunningly disguised to catch and differentiate different types of color blindness. Even "normal sighted" people usually make a few mistakes with this test.

The usual treatment for color blindness in men rejected from military or other service is called the light and filter treatment. As described by optometrists it consists in the fixation of colored sources of light for several minutes, and the use of filters, with daily check of progress on the pseudo-isochromatic plates—the "Light and Filter" treatment.

Two instructors in optometry at Ohio State University, Charles S. Bridgman, Opt.D., Ph.D., and Henry W. Hofstiter, Opt.D., Ph.D., skeptical about this method of improving color vision,

tested several subjects, three of whom had passed the Navy tests successfully after treatments by a practicing optometrist. They concluded that their results did not in any way support the assumption that the *exercises* intended to train color vision are of any assistance. It appeared on the contrary that the exercises are merely time-consuming, that the improvement in scoring is related only to the *learning made possible by repeated testing*. The following is a sample of the results obtained. A color blind subject from the eye clinic, tested in the usual way, scored 15 correct out of 46 plates. He was tested four times. He was told when he was wrong but was not told the correct answer nor given any other instruction—simply retested again and again. His scores were 27, 35, 43 on the second, third and fourth tests. Similar results were shown by other subjects.

The authors further concluded that "those who criticize the practice of training color vision are entirely justified." They "find no evidence that color filter treatment is effective in improving color blindness." They "question the type of evidence which has been accepted as conclusive indication of color vision improvement"; "this proof can be supplied only by measurement of fundamental color vision functions." (Rayleigh equation, etc.) The treatment, they said, is not justifiable since it may lead to the acceptance of responsibilities which the patient cannot fulfill, though he erroneously believes himself cured of color blindness.

Eye Exercises for Myopia

An important group of patients with myopia and other defects earnestly desire to get rid of their glasses. These patients have been told by ophthalmologists or optometrists that they must wear glasses all the time. They go to a follower of Bates who tells them to discard their glasses, which are crutches. To their surprise they find that nothing serious happens! Their sight, of course, is still blurred for distant objects but they find that by practice they acquire the ability to make out objects better through the blur than when they only temporarily took off their glasses during the glasses-wearing period. They are likely to exaggerate this gain in talking about it.

A young man who had been wearing concave lenses asked the writer if there were any way he could pass the test for 20/20 vision. His visual acuity was 20/30 without glasses, 20/15 with his glasses which were concave. To induce relaxation of accommodation, he was given convex lenses. After a few days his vision without glasses was 20/15 and he read 20/15 even with +0.50 sphere. Thus, he was able easily to pass the test for 20/20 vision without glasses. Was his myopia cured? No, because he did not have true myopia to begin with. He had acquired the habit (never mind how) of exerting a small amount of accommodation by which he was able with concave lenses to see extra well. This had become so confirmed a habit that, when the concave lenses were taken off for a few minutes to test him without them, he still exerted unconsciously and automatically this (now unnecessary) accommodation and could see only 20/30 unless the concave (myopic) lenses were given him. This is called pseudo-myopia. Thus what the writer's treatment had done was to teach him to relax his accommodation. He was judged myopic by someone who found that when −0.50 sphere was placed before his eye he said, "That is better, clearer." If a young man who sees 20/15 sees it better with −0.50 sphere it shows that he has good accommodation, not that he has myopia. Other evidence is necessary before that diagnosis is justified. He should read one or two *more* lines with the minus glass than he reads without.

Cases of true myopia have been reported in which the vision without glasses has been improved by exercises of various sorts, from 20/70 or even less to 20/20. The writer has not had personal experience of such cases.

Orthoptic Exercises

A well recognized field for treatment by eye exercises is the field of disturbances of motility and binocular vision. These are often spoken of as "muscle" troubles. It is true that the movements of the eyes are made by the muscles but it is not true that faults of motility are due to defects of the muscles themselves, except in rare instances. As pointed out above, one is dealing with a *neuro-muscular mechanism for eye movements* and it is the *neuro* part that is usually at fault. In many forms of trouble with eye movements

(heterophoria, cross eyes, etc.), much can be accomplished by eye exercises skillfully used by orthoptists.*

A very good example of how exercise, practice, learning, result in ability to see and take in what would be absolutely bewildering to a novice is furnished by an orchestral score. On each page are the notes for all the different instruments of the orchestra being played simultaneously. When a conductor has learned to read such a score, it is not because his vision has improved, but because he has learned how to use it by practice, by exercise.

Many methods of treatment by eye exercises, dispensing with glasses, have been advocated. To describe or even enumerate all is not possible here. The methods advocated by Huxley, Bates, Peppard and others consist in relaxation (passive and dynamic), palming, winking, breathing, sunning; also a group of procedures aimed at increasing mobility, swinging (short and long), flashing, shifting, nose writing.

Extravagant Claims Unjustified

Since exercises of various sorts have been proven so successful in treating many eye conditions, it was inevitable that some devotees of that kind of treatment should go too far and make exaggerated claims. That always happens. It is the duty of the broad-minded, open-minded, well-informed investigator to sift out the good from the bad.

If the results of the various treatments by regular and by irregular practitioners are subjected to the two methods of evaluation mentioned earlier in this article, it is found that in many cases the results measured by scientific methods are sound and good. Other cases show no measurable gain in scientific units such as visual acuity, color vision, motility (cross eyes, etc.), but do show gain when the opinion of the patient himself is asked.

For example, Aldous Huxley has poor vision due to cloudiness of the cornea from old inflammation. Experience with many such cases has demonstrated that this is a condition which has a tendency to show but slight improvement, never resulting in complete cure. Huxley consulted many ophthalmologists with unsatisfactory

* The name for this department is orthoptics, and those who practice it are orthoptists. Some of them have achieved brilliant success.

results. They admitted they could do nothing. After treatment by one of the followers of Bates, Huxley was able to report marked improvement. Judged by the scientific measurement of visual acuity, the Snellen charts, Huxley reads very little more than he did before treatment. Judged by the standard of the patient's own impressions, he *can see better;* at least he can and does use his eyes with much more comfort and does more work with them and is more reconciled to his lot. No impartial judge can deny that this is a worthwhile gain.

It should be distinctly understood, however, that it is not an improvement in the eyes, the ocular part of vision, but in the cerebral, mental part of vision. There has been a tendency to neglect this side of seeing, but as shown in the earlier part of this article, it is a very large and important part, fully 50 per cent. Most of the gains from exercises of various sorts are gains in the sphere of mental or cerebral functioning. This is to be expected, from the nature of the case. Practice alone will not avail much to improve the optical image on the retina, which depends on physical conditions for the most part. But practice, training, exercise will improve the use made of the retinal images by the mind. It is one of the important medical resources.

When untrained and therefore more or less ignorant people attempt to use such resources of treatment it is inevitable that they exaggerate their results, that they fail to put things in proper perspective, and that they embroider their treatment with irrelevant details of no value except as means of impressing the uninformed and aiding in getting the more significant things done. As a result, more or less hocus pocus creeps in. This alienates those who see through these gestures. They are too apt to jettison the whole cargo, the good with the bad.

Are Exercises Harmful?

The harm that can come from eye exercises is due to the curious weakness of the human intellect which sees the good in something and jumps to the conclusion that that is the whole story. Just as the followers of Mrs. Eddy, seizing upon the valuable truth that many sicknesses are more mental than physical and can best be cured by treating the mind, jump to the conclusion that all diseases

are of that nature and so do great harm to patients with definite physical ailments which can be cured only by physical treatment—for example cancer or glaucoma, so these followers of Bates presume to treat all sorts of eye conditions by taking away glasses and giving exercises usually with a large admixture of mumbo-jumbo quite satisfactory to the ignorant and, therefore, gullible portion of the public. When glaucoma or cancer is treated in this way, of course, irreparable harm is done.

Conclusions

Seeing is one half physical; it deals with the formation of a good image on the retina and the co-ordination of the two eyes by proper movements of the eyes in fixation and fusion. The other half is mental or psychical and deals with the perception and interpretation of the sensations produced by the images on the two retinas. The first is what goes on in the eyes; the second is what goes on in the brain.

To improve the physical part—the image formation and the fixation and fusion—is the daily task of eye specialists. They do this chiefly by the skillful use of glasses.

To improve the mental or psychic part requires training, teaching, exercises, practice. These are well known to be the indispensable and efficient means by which one learns to see and also learns to do a thousand other things that have to be learned before they can be well done. This side of the problem of seeing has been neglected by ophthalmologists, who were absorbed with other fascinating problems of seeing whose solution is more direct and precise, more mathematical. A natural result is that the problem of the mental, psychical side of seeing has been seized upon frequently by irregular practitioners. Do not infer from this that no ophthalmologist pays attention to the mental side; that would be a gross error. The treatment of psychical difficulties is obviously not at all a clear-cut, mathematical problem. It calls for insight, sympathy, tact, wisdom as distinguished from learning.

To reach the psyche, it has been found by many a clever worker, some of whom are charlatans, that foolish gestures and more or less mumbo-jumbo facilitate putting over the simple underlying principles. When these are stripped of their mummery they do not

appeal to the average human intellect, which is incurably superstitious and craves explanations which are not scientific, prefers them, feeds on them. How best to deal with people of that type when they are patients is a far more difficult problem than how to correct a difficult case of refraction and that, in turn, is more difficult than to perform a cataract operation.

The answers to the questions in the title are now obvious: eye exercises do a great deal of good. They are indispensable in learning to see. They may do harm indirectly if they divert a patient with some disease needing treatment of some special kind so that he is led to follow treatment by exercises instead of consulting a competent ophthalmologist and finding out the true nature of his trouble. The limitations to treatment by eye exercises are also clear. It cannot affect certain physical conditions ("which of you by taking thought can add one cubit to his stature"), but is potent in treating the psychic side of vision. It requires a very high degree of skill and acumen to steer a true course, avoiding the neglect shown by many otherwise competent specialists and avoiding the excesses of over-zealous enthusiasts. Truly, "art is long, life is short, judgment is difficult."

The National Industrial Eye Health Program and Its Relation to Vocational Rehabilitation*

Jack Masur, M.D.

THE Society's eyesight utilization program, according to the author, may serve as a guide for a rehabilitation program for the returning visually handicapped (not blinded) war veterans.

THOSE of us who strive to develop vocational rehabilitation as a series of professional services which will offer even more than eyes for the blind and feet for the lame have long hoped for the day when we shall have well developed programs for all groups of disabled—the hard of hearing and the deaf, the cardiac, the tuberculous, the diabetic, the arthritic, the asthmatic, the epileptic, the psychiatric patient, and all others who find themselves in need because of their occupational handicaps. The wheels of a large program grind slowly and it is in just such a program as carried on by the National Society for the Prevention of Blindness that we find the stimulus and the leadership that are indispensable for the encouragement of specific programs with high standards in our state agencies for vocational rehabilitation. The history of the activities of this Society already offers two excellent examples of a successful partnership between a voluntary organization and government: first, the dramatic decline of blindness due to ophthalmia of the newborn; and, second, the increasingly widespread acceptance of the need for sight conservation classes in the public schools.

It is an interesting commentary on our modern society that the successful promotion of a social program designed to better the health or increase the happiness of our people must be based on the economic or materialistic motive. We say "public health is

* Presented at 30th Annual Meeting of the National Society for the Prevention of Blindness, December 14, 1944.

purchasable"; industrial hygiene saves insurance premiums; vocational rehabilitation is a sound investment on a dollars and cents basis; venereal disease control spares us so many million work hours, and so forth. Since we are essentially a practical people, those of us interested in developing programs dear to our hearts shrewdly learned that if it is to have the quality of permanence our approach must be planned in a logical way and that it is more often a matter of opportunity than simply a matter of time. If we do not learn to sell our programs on a realistic basis, then I fear that our results will be as thin as the famous homeopathic soup that was made by boiling the shadow of a pigeon that had been starved to death.

Since this National Society is by its very name dedicated to preventing blindness, which is the king of terrors for the workman, it is altogether appropriate that it lead the way in stimulating the interest of management, labor, government, and ophthalmologists in the extension of sight-saving programs in industry. The war crisis emphasized the importance of sound industrial hygiene practices for the conservation of vision. Young men with excellent vision were being inducted into the services; there was a vast number of new workers unaccustomed to modern machine tools; there was an increasing use of older workers with diminished vision; there was the widespread utilization of chemicals incidental to the manufacture of war products—all of these factors stressed the need for action. It was apparent that there was a great salvage of potential manpower possible in a well organized industrial ophthalmological program. There was need to recognize more generally that when a job needed vision, the man could work only as well as he could see—if only industry could be sensitized to the importance of selecting and placing workers in accordance with an understanding of their visual strength and limitations. The demands of the war effort made it imperative that every worker be hired, that production be increased to the maximum and that spoilage be reduced to a minimum.

The surveys sponsored by the National Society for the Prevention of Blindness included job analyses and a review of plant practices in eye care. The studies revealed indifference in industry to eye conditions, even in plants which had already introduced

general safety practices. A survey of 50 plants employing 166,682 workers revealed that only 10 per cent reported that they had performed job analyses for visual requirements; less than a third of the plants offered visual examinations; and only 14 per cent provided periodic eye examinations. In reports of accidents to safety departments only 22 per cent included a report on the eye condition of the person involved and only 12 per cent made reference to illumination at the site of the accident. The latter points are particularly interesting since it is believed that at least one out of every four accidents in industry is related to faulty vision or poor illumination. The survey also indicated that in the group of plants reported, approximately 70 per cent fitted safety glasses to their workers, but there was little evidence to show educational efforts through unions and supervisors or enforcement through mandatory regulations by management—significant because it is known that 98 per cent of accidents to eyes can be prevented through adequate safety measures.

In April and May of this year, the Society conducted a seminar on the Industrial Aspects of Ophthalmology in New York which aroused a great deal of interest in the joint activities of the Society and the U. S. Public Health Service, and focused the attention of ophthalmologists on the visual bottlenecks confronting our war industries. Our need for a complete eye conservation program is complicated by the lack of a sufficient number of industrial ophthalmologists. The challenge to ophthalmology repeated time and again throughout the conference was to conserve the eyesight of every employed person.

Each year there are over 300,000 industrial eye accidents, of which 60,000 are compensable. These figures are even more striking if we realize that annually approximately 1,000 workers lose the sight of one eye and approximately 100 workers lose the sight of both eyes. It will be recalled that the Society's report pointed out that 98 per cent of injuries to the eyesight of workers can be prevented if the employee is furnished with and will wear the safety glasses or other form of equipment best suited for his work to protect him against flying particles, fumes, dusts, corrosive substances, and glare. It must be borne in mind that there are still other factors resulting in injuries to eyesight: improper illumina-

tion, failure to correct subnormal vision, the exacerbation of early visual difficulties, infections, and failure to diagnose such eye pathology as glaucoma, diabetes, and cataract.

It has been estimated by screening tests that at least 25 per cent of workers have subnormal but correctible vision. In these days it may well be that 40 per cent would be closer to the actual figure.

At the recent Seminar, Dr. R. C. Williams and Dr. Townsend of the U. S. Public Health Service, and other discussants, urged that more industrial ophthalmologists be prepared for the task of assisting management and labor to select jobs suitable to the visual ability of the workers. The U. S. Public Health Service has recognized that the need for ophthalmologic service in industry is as great as the acknowledged need for medical, dental, and nursing services, and has assigned a Service Officer, Dr. Lo-Presti, who is an ophthalmologist, to the National Society for the Prevention of Blindness to assist in the development and conduct of the program of eyesight protection in industry.

The eminent ophthalmologists participating in the Seminar stated that the maintenance of visual fitness and careful evaluation of job placement according to industrial visual skills were fundamental in the industrial program. It may be well to repeat here the outline of a complete program for the conservation of vision in industry:

1. The medical staff of the plant should include an ophthalmologist interested in industrial hygiene.
2. Industry, including the small plants, should have pre-employment vision examinations, using a screening method to conserve the time of the ophthalmologist.

   I might add at this point that we believe that the interests of handicapped persons will best be served if pre-placement examinations to appraise the handicaps of disabled applicants are carefully distinguished from examinations for any other purpose.
3. There should be provision for periodic rechecks. This is especially important because of frequent transfers of workers to new jobs in plants.

4. It is important that there be suitable record system with adequate data on job classification analyses to aid in the proper placement of all potential and present employees. Visual acuity, depth perception, muscle balance, color discrimination, are all qualities of perfect vision, but most jobs do not demand such perfection. It has been pointed out that a worker deficient in any one of these qualities may be sufficiently equipped for a number of jobs in a plant but may be entirely unfit for work that demands particular visual qualifications. It must be stressed that to place a worker with defective vision in a job without proper analysis of his condition or the requirements of the job is to jeopardize the sight and safety of the worker and the quality of his work.
5. Very important is the provision for examination by an ophthalmologist of employees with subnormal vision, for the correction of defects, and furnishing glasses as indicated. The corrective measures should provide visual acuity as nearly normal as possible for the particular job. Personal glasses fitted for reading at the usual distances are generally quite different from the working distance at the bench or machine tool.

   In addition to the correction of refractive errors, the medical examinations will include the diagnosis of general diseases with eye manifestations and the diagnosis of specific eye conditions such as trachoma, iritis, glaucoma, etc.
6. Protection programs should place emphasis on continuous application through educational methods and mandatory regulations.
7. Most obvious of all is the necessity for an intelligent first-aid program to provide expert care of the eye for foreign bodies, lacerations and punctures, burns and scalds, and bruises and contusions.
8. We are beginning to understand more about the need for study of adequate illumination to improve the visibility of industrial jobs. It is well known that eye fatigue is a cause of industrial accidents. Proper brightness with an understanding of brightness contrasts and ratios will yield a greater

factor of safety. Illumination engineers remind us that lighting helps those who need help most—particularly the older workers.

9. Little attention has been paid to the study of occupational lenses. We should remember the importance of subnormal work distances as they relate to normal visual distances. The further development of the use of occupational correction of vision is likely to yield excellent dividends in production as well as the conservation of eyesight.
10. We are learning that there should be special consideration of specific visual problems, such as color discrimination and depth perception.
11. We must stress the evaluation of problems of vision as they relate to general health: ventilation, posture, nutrition, domestic and social relations. Here as well as at every other point in this program there is need for close teamwork between the ophthalmologist, management, safety engineers, and other members of the medical department.
12. Finally, ophthalmologists need to study medico-legal relationships to understand the relationships of labor and management to the eyesight conservation program.

We believe that one of the most significant advances in the field of vocational rehabilitation was the pioneer work of the Minnesota group in the development of the concept of Selective Placement in conjunction with Physical Capacities Analysis. The adoption and extension of this technique by the War Manpower Commission and certain large industries, particularly the shipyards, mark a new era in the utilization of disabled persons in industry. The concept emphasizes "capabilities" rather than "disabilities." A disabled worker who is well placed is no longer handicapped. A person's ability to perform a given job is not dependent on his over-all physical makeup, but rather on his skill, aptitude, and experience. A preplacement medical examination plus an analysis of the physical requirements and environmental conditions of a job are the elements of the selective placement method. There have been some questions raised concerning the paucity of satisfactory objective tests available to physicians in order to determine the real work

capacity of individuals suffering from various types of disabilities, such as heart disease, tuberculosis, asthma, orthopedic conditions, etc. It has been asserted that physicians are obliged to render arbitrary evaluations based principally on their personal clinical experiences and that we need to develop reliable objective methods for measuring uniformly the physical capacity to perform such activities as lifting, carrying, pulling, climbing, stooping, twisting, etc. However valid these criticisms may be for many categories of physical disabilities, they are probably least applicable to visual disabilities since we are dealing here with one of the more objective medical specialties whereby ophthalmologists employ precision techniques of measurement. We in vocational rehabilitation are, therefore, intensely interested in promoting the use of selective placement and physical capacities analysis methods for the visually handicapped, since it will afford the best opportunity for auditing the long-term effectiveness of these techniques.

We physicians who toil in the field of rehabilitation have to remind ourselves—or more accurately, be reminded by others—that the successful rehabilitation of a disabled person is not solely a medical problem. It is a continuous series of services in the medical, social, and industrial spheres. Rehabilitation has been defined as the restoration of the handicapped to the fullest physical, mental, social, vocational, and economic usefulness of which they are capable. The report of the Tomlinson Committee of the British Parliament emphasizes that rehabilitation is satisfactory only if the disabled person can take and keep a job in normal competition with his fellows. A large proportion of disabled persons can be rendered capable of self-support and of leading a full and useful life—and the Barden LaFollette Act under which our expanded vocational rehabilitation program operates, recognizes this as a public responsibility. Vocational rehabilitation is a public service in the same sense as public health, public welfare, and public education.

It is of the utmost importance that the handicap of disablement not be made worse by lack of understanding, prejudice, and therefore lack of opportunity. In order to secure for disabled persons their full share of opportunity within their capacity for normal employment ordinarily available in the labor market, we should continue to encourage the good will which now exists among

employers towards persons handicapped by disablement. Most important is the necessity for a sustained public relations program to inform employers, labor unions, legislators, and the general public that vocational rehabilitation can fit a disabled person to the job successfully by means of physical restoration, vocational guidance, and training. Employers in particular need to be reassured that under suitable conditions disabled persons can serve effectively without hazard to themselves or others. An excellent example of this type of publicity is the published declaration of attitude by the Association of Casualty and Surety Executives, which encourages member companies to promote the employment of disabled persons. This statement points out that the initial rate for Workmen's Compensation is governed by the industrial classification. Physical defects of disabled persons are not considered in determining that rate, and no higher rate is charged to the employer because of the employment of physically disabled persons. The employment of disabled persons is not prohibited in any way by the terms of Workmen's Compensation insurance policies. Accident experience, good or bad, will ultimately be reflected in the cost of insurance, but the report of the Casualty and Insurance Executives goes on to remind employers that surveys have shown that physically handicapped persons are good workers and that there is evidence that their absenteeism and labor turn-over records are strikingly better than those of the ablebodied; that they have fewer accidents; that they are conscientious, superior workers; that they expect no favors and produce as well or better than the average of normal people.

We must recognize, however, that in the very infrequent cases where handicapped persons sustain serious accidents which result in permanent total disability, the employer is confronted with a disproportionate liability. In all fairness employers who hire handicapped workers should be protected and should be responsible only for the second injury. The remainder of the liability should be borne by industry generally. A sound and adequate Second Injury Fund Law should be in effect in every state to minimize this liability to employers and to assure payment of full compensation to handicapped workers in all cases in which they suffer injury, including permanent total disability.

At this point, I want to refer again to the relationship of the objectives of the National Society for Prevention of Blindness to the activities of our vocational rehabilitation program. An important rôle of vocational rehabilitation borders on the prevention of blindness. Quite literally we have frequently quoted the example of the glaucoma patient to illustrate our interpretation of the word "static" which is used in our Public Law 113 to define eligibility of disabled persons for physical restoration services. "Static" in our interpretation means "relatively stable" or "slowly progressive" or "chronic, but amenable to treatment." Thus we have repeatedly stressed that it would be folly to await the terminal stages of blindness in glaucoma, when the disease had run its course to the final residual state of "static" in the ordinary connotation before accepting the patient for medical and surgical care as a client of the rehabilitation agency. In a more general way, however, we are constantly aware of the obligation of the program to the visually handicapped. If we are to function effectively, our state agencies should make available to their clients with visual handicaps medical diagnosis and treatment of high professional standards, including the services of qualified ophthalmologists and the provision of glasses, expert vocational counseling, skilled vocational training, and selective placement in employment in accordance with the principles of eyesight conservation in industry which we have discussed in some detail here. There is one point of more than passing importance that I should like to mention. The relationship of the increasing significance of chronic diseases in our aging population and their influence on our national economy must be kept before us. The relationships of chronic illnesses to planning programs of vocational rehabilitation and the industrial health problems which arise from the use of a larger and larger number of older workers, are subjects for another day. I do not need to remind you that there is a tremendous increase in the percentages of visual defects in the mature age groups, especially for near vision and muscle balance. The proportions of the problem are indicated by the fact that in 1900 there were approximately 3 million persons in the United States who lived to the age of 65, whereas today there are 9 million who live to the age of 65. Research in the problems of vision made defective by the aging

process deserves the attention of this Society as one of the fundamental research projects in the long-term campaign for the prevention of blindness.

Finally, I want to assure you that we also recognize that we owe a special obligation in the matter of eyesight conservation to all other disabled persons suffering from various types of disabilities. Special attention must be devoted to visual protection in all handicapped persons so that their difficulties will not be compounded. The failure to check a client's vision carefully may result in an unsatisfactory job placement: faulty occupational vision means poor work performances which is equivalent to unsatisfactory vocational rehabilitation.

Why Dark Glasses?

Captain Adolph Posner, Medical Corps, A.U.S.

DESCRIBES the uses and misuse of tinted glasses.

DARK glasses are useful in reducing the dazzle of strong light. However, the promiscuous wearing of dark glasses which has become a fad in recent years, has been directly responsible for many cases of impaired eyesight by creating a false sense of security in the wearer. For it is not generally realized that the commercially available dark glasses protect the eyes only from the visible and ultraviolet, but not from the infra-red, or heat rays in which sunlight abounds.

There was, for instance, Helen, a twenty-year-old college girl who came in one August morning, hardly able to see enough to get about. She had been on the beach the previous Sunday enjoying the warmth of the sun as she lay on the sand, and since she was wearing very dark glasses, she could amuse herself by observing intently the sun from which all this life-giving warmth emanated. When she got home she saw before her a great black ball which covered every object at which she tried to look. This black ball was shaped exactly like a sun; it was the after-image of the sun. She knew from experience that whenever she used to look at a light, she would then see a dark after-image for a short time. But the black ball would not disappear. It remained next day, in fact it became denser and larger. This alarmed her and she decided to see a doctor. Helen had burned the central part of the retina in each eye. This is the most delicate part of the eye, containing as it does, the optic nerves which enable us to read and do other fine work. She did not realize that the heat rays of the sun are not held back by the dark glasses to the same extent as the light rays and that these rays are focussed on one spot in the eye. The eye acts like a

burning glass (a strong convex lens) with which we as children used to burn a hole in a sheet of paper by focussing the sun's rays on it. Helen has recovered some of her vision, but she will always carry with her a dark spot in the center of her field of vision as a souvenir of that sun-bath on the beach.

Helen's condition has not yet been dignified by a popular name because the sun-glass craze has only begun; but we may classify her case with other cases of so-called "eclipse blindness." From time immemorial people have been fascinated by the phenomenon of a solar eclipse. They would smoke a piece of glass over a flame and observe the progress of the eclipse through the smoked glass—many a person would thus burn a hole in his retina and would be rendered unable to enjoy the next eclipse.

Eighteen hundred years ago, Galen (131–201 A. D.) had already called attention to the fact that "at the eclipse of the sun, a very great many who attempted to secure an all too exact observation of the phenomenon, and therefore gazed immovably at the sun at last became completely blind, without perceiving that there was anything the matter." The adverb "completely" is an exaggeration; but then Galen was a forceful writer and sacrificed accuracy for dramatic effects.

To protect the eyes from the harmful effect of heat rays, there are special goggles, such as those which are worn by welders and glassblowers. In general, a glass which is rich in iron salts absorbs heat well. However, such glasses are not on the market as sun-glasses. They are too expensive and too heavy for comfort. The simplest preventive measure is to wear light colored sun-glasses, or none at all. Then it will not be possible to look directly into the sun.

Another ray which is harmful to the eye is the ultraviolet ray. Like the heat ray, it is invisible. It is therefore wrong to speak of ultraviolet light. The greenish color of an ultraviolet-ray lamp is not due to the ultraviolet, but to certain visible rays it emits. Sunlight contains a great deal of ultraviolet radiation. The best artificial source is the glow of mercury vapor.

The spectrum of mercury vapor contains no red rays, so that red lips look black and faces take on a ghastly appearance. The ultraviolet rays have a shorter wavelength than visible light. They cannot pass through glass, so that the bulb of the lamp must be made of quartz

instead. Neither can ultraviolet rays pass deeply into the eye. They are entirely absorbed by the cornea, which is the first structure they meet. They give rise to a painful inflammation of the outermost layers of the eyeball (conjunctiva and cornea), characterized by tearing, and inability to keep the eyes open. This condition is known as electric ophthalmia and used to be common among motion picture actors, since they cannot wear protective goggles while they are on the set, exposed as they are to a flood of electric lights. It is now possible for actors who are unusually sensitive to ultraviolet rays to protect their eyes by wearing tinted contact glasses. These are little glass shells which are worn behind the eyelids and are invisible because they fit directly on the eyeball. When taking ultraviolet treatments or sun baths, it is important to wear goggles which are either amber colored or gray. (Even colorless glasses filter out a large percentage of ultraviolet rays).

Mountain climbers who don't protect their eyes with goggles often get a swelling and inflammation of the eyes. This is caused by the ultraviolet rays reflected from the surface of the snow. It is known as "snow blindness." Eskimos and even their dogs are not immune from this condition.

There is another, much more serious condition, which is also sometimes called "snow blindness." Here, the inflammation is not the essential feature, but there is an actual loss of sight. It occurs among soldiers or adventurers who have wandered for weeks in the cold and who are poorly supplied with food, especially if they lack vitamin-containing foods such as fresh vegetables and fruits. These people develop an avitaminosis, which, in addition to cold and the reflection of light by snow, produces a weakness of the optic nerve, so that the subjects become either partially or totally blind. A lack of vitamin B^1, or thiamin chloride, is chiefly responsible for this type of blindness which is known technically as "optic neuritis." Galen relates an excellent example of such snow blindness probably caused by cold, fatigue, and lack of vitamins.

"Remind thyself how the power to see is hurt by a bright and dazzling ray; how the eyes of Xenophon's soldiers suffered, who had to march so long over snow covered fields. Yes, perhaps thou knowest nothing about it and hast never disturbed thyself about Xenophon."

And finally, an example, also from Galen, of how light alone may affect an exhausted, starved organism; although the story should be taken with a grain of salt: "I believe that neither hast thou ever heard of Dionysius, tyrant of Sicily, who had a small structure erected over his prison, which he kept bright and shiny by having it washed with chalk. Into this structure he led his prisoners after a long confinement in the dungeon; and when they who were suddenly transported from darkness into brilliant light, looked into the splendor with joy, they were completely blinded."

It is interesting to note that while the heat rays from a distant object like the sun can burn a hole in the retina, heat coming from a diffuse and near-by source, such as the glass-melting furnace, is absorbed in the front part of the eye and heats up the lens of the eye producing cataract. "Glass blower's cataract" is an important industrial disease which can be prevented by use of protective goggles.

The extraordinary prevalence of cataract in warm countries such as India, can probably be accounted for by the hot climate, combined with inadequate nutrition.

Colored lenses have been used since the middle of the 16th century. The first colored lenses were green. In the 17th century, blue glass was introduced; but it was not until the middle of the 19th century that it became immensely popular because of certain life-stimulating properties which were found to be contained in the blue rays of sunlight. These blue glasses, thus, were not worn to protect the eyes from the effects of light but rather to "stimulate" them. Fortunately, they did not transmit the short ultraviolet rays which are injurious to the eyes. Blue glasses are rarely worn today.

Gray, or smoked lenses were first made in London in the middle of the 18th century. They are still known by the name "London smoke." Amber lenses were first made in England in 1832.

Then came an avalanche of lenses of various colors, each designed to absorb a definite portion of the spectrum. In 1913 Sir William Crookes, the inventor of the Crookes vacuum tube, devised a green lens which would absorb both the ultraviolet and the infra-red ends of the spectrum. The lens now popular as the "Crookes lens" is brownish gray and absorbs only ultraviolet rays.

The color in a lens is produced by mixing salts of various metals with the glass. Cobalt oxide gives the glass blue color; chrome oxide

and ferrous iron oxide give green; gold oxide, red; Didymium, salmon pink, silver oxide and uranium, yellow; manganese, violet. All heat-absorbing glass contains a large amount of ferrous iron oxide.

Ordinary colorless crown glass lenses transmit 80% of all light rays. They give partial protection against sun-burn, since they hold back completely the short ultraviolet rays, which are the most dangerous. Brownish gray lenses absorb the short as well as long ultraviolet rays and are thus useful protective glasses for mountain climbing. Flesh-colored and smoke (gray) lenses diminish the total quantity of light more or less uniformly over the entire range of the spectrum and should be worn by persons who are exceptionally sensitive to the dazzle of reflected light. Green and bluish-green lenses absorb both the short ultraviolet and some of the infra-red rays. They are to be preferred for flying goggles and for beach wear.

Recently, lenses with polarizing properties have been offered as sun-glasses. They are of value when dealing with polarized light only. Reflected glare from water or wet pavement is partially polarized, especially if it makes an angle of 20–30 degrees with the reflecting surface.

A few practical suggestions concerning the choice of dark glasses may be of service to the reader.

1. Dark glasses absorb light uniformly in the entire field of vision. Hence they do not eliminate glare, which may be defined as a localized intensely illuminated area of the retina.
2. The usual sun-glasses do not offer protection against the heat-rays of the sun.
3. The choice of the type of glasses should be entrusted to the judgment of a competent physician.
4. The light shades of tinted lenses are of little practical value, while the very dark shades should be avoided because of the danger of burning the retina.
5. Sun-light of not too great an intensity is not in itself deleterious to the eye. Certain individuals may be unduly sensitive to light, but in all such cases a medical examination is indicated before resorting to sun-glasses.
6. Finally, the indiscriminate use of sun-glasses as a fad of fashion, and their promiscuous sale by drug and cigar stores is to be condemned.

Measurement and Prevention of Eye Flash

Philip Drinker, Sc.D.

THE subject of eye flash is an important one in the consideration of eye safety, especially in the shipbuilding industry, and the author points out in this article various means for the prevention of eye damage from this cause.

IT HAS been reported recently[1] that some 40 per cent of the calls at shipyard dispensaries and first-aid stations are for eye injuries. In new yards, with inexperienced workers, about half of these calls are for "eye flash." This is an unfortunate misnomer but a term which is free of all ambiguity—the doctor, the patient and everyone else knows precisely what is meant.

The burns which can and do occur occasionally from flashes are the result of a sudden heavy discharge of current through a fuse, circuit breaker, or the like—a real flash, with the power almost of an explosion, vaporizes the copper conductors in a momentary blaze and persons nearby may be severely burned.

Protective Glass

In arc welding, nothing comparable occurs. It is well-known that the electric arc, regardless of the electrodes used, is fairly rich in ultraviolet light. The cutting flame of the acetylene torch also gives off ultraviolet. Both the electric arc and the gas torch have such high intrinsic brilliancy that they should not be viewed without the aid of proper goggles or of special glass in the welding shield.

The specifications for such glass have been developed and approved by the Bureau of Standards and adopted by the American Standards Association.[2] We have no criticism of these standards and no fault whatever to find with their use during welding, cutting, burning and even shrinking.

Most workers are cautioned not to look at the welding arcs and no welder would try to weld without his welding shield. Also, he knows he can get a nasty burn, like sunburn, on his arms and neck if they are not covered. But when he flips up his welding shield to change rods, he is very apt to receive the ultraviolet rays from his neighbor's arc.

If he is near enough and the exposure is long enough, he knows he will be burned, especially in his eyes. But it does not happen in a "flash"—it takes a surprisingly long time unless he is within a few feet of the arc.

Distance and Exposure

The question we have been asked repeatedly is: How near must one be to get an eye burn in a reasonable length of time? It was evident from the medical literature that no one had ever troubled to determine the precise relationship of time and distance which we needed to know in our shipyards.

The monograph by Verhoeff and Bell[3] describes in great detail the effects on the eye of various radiations. These authors showed that the biologic response varies inversely with the square of the distance from the source of radiation and directly with the time of exposure. They showed further that, within a 24-hour period, the effects were cumulative.

Their experiments were done with a mercury vapor lamp and a magnetite arc. So far as we know, no one had attempted to define in practical terms the time-distance relationship which applies to modern arc welding.

Drs. Kinsey and Cogan, at the Howe Laboratory of Ophthalmology of the Harvard Medical School, performed with an electric arc welding set a series of experiments[4] and determined the combination of distance and time necessary to produce minimal ocular lesions in rabbits, dogs and men.

Light Meters

It was found that a simple way of measuring dosage was to measure illumination at the subject's eyes by means of a light meter such as is commonly used in photography. This meter is intended to be used with visible light, but it was found by compar-

ing readings with those of an ultraviolet meter that the ratio of ultraviolet to visible did not vary significantly with changes in electrodes or with changes in operating current and voltage.

Therefore, if we find that a typical shipyard welding unit will just cause a perceptible eye flash in man, when viewed at 7 feet for 20 seconds, we know that at 50 feet a comparable exposure will be $\left(\frac{50}{7}\right)^2 \times 20$ seconds or 21.3 minutes.

A number of us, without any protection, looked directly at welding arcs for ten minutes at 50 feet without any burn resulting. Obviously we played safe as the dosage we used was less than half that of the computed threshold.

The welding expert will object that what we call dosage can be varied according to the way welding is done and again with the equipment, current, and voltage available. This criticism is just and to take such variations into account one should measure the intensity of illumination caused by the arc at the point where the possible eye flash is to be studied. In bright daylight, the light from the sun interferes with such measurements, but in the holds of ships, in shops, and at night there is no appreciable interference by extraneous light.

Protection

No one can say just how many minutes daily of unprotected exposure to welding arcs the average shipyard worker experiences. Arbitrarily we chose ten minutes, but it might be argued that the figure should be more or less. At 50 feet, the average man will need over 20 minutes exposure to show any real evidence of eye burns, and at 100 feet he would need 80 minutes, assuming typical shipyard welding arcs.

The ultraviolet screening effect of ordinary glass, including that in all types of eyeglasses and safety goggles, is so good that eye flash virtually is non-existent among workers who wear glasses. All shipyard men know that the yards can not be lighted up like factories so that colored goggles may offer an annoying and sometimes serious risk of accident.

We would welcome a more logical system of issuance of goggles; that is, issue the colored anti-flash goggles only where there is a

definite need for them, such as to men constantly exposed to indirect radiations from electric arcs. Most shipyard workers would be adequately protected by hardened lens safety goggles with side shields.

But all goggles to be worn near welding operations should be equipped with side guards for protection against foreign bodies.

In conclusion, we would like to point out that it was not our intention to investigate the diagnosis or treatment of eye flash. For that we would refer the reader to the paper by Dr. Rieke given before the Occupational Disease Session of the 32nd National Safety Congress.

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Medical Social Work in Sight Conservation as Developed in the State of Washington

Elizabeth T. Mills

DESCRIBES how the Department of Social Security carries on sight conservation in one State.

IT IS significant that the chapter of Washington's 1937 Social Security law which established the Division for the Blind is entitled "An act establishing within the Department of Social Security a division for improving the condition of the blind *and for the prevention of blindness* . . ." Continuously since 1937 Washington's program of services for the blind has been accompanied by statewide effort in prevention of blindness and in services to the partially sighted. During the seven years of its history the program has developed and changed according to needs in the state, but in general has had five main emphases: eye treatment and surgery, work with schools in behalf of visually handicapped children, medical social work consultation to welfare and health agencies in relation to persons with eye difficulties, community education for prevention of blindness, and legislation to protect sight and improve services to the partially sighted.

As a medical social worker looks at this seven-year program she finds her attention diverted from facts, figures, and charts to the human stories which illustrate the vital substance of any public program, and its justification.

> S. D., 60, had been unemployed for five years following accidental amputation of his left arm, though previously he had been a successful cement worker. Gradually he began to lose sight in one eye from a cataract. Since he still had normal sight in the other eye, surgery was not immediately authorized, but as cataract developed in the other eye as well, the services

of an eye surgeon were made available, and a successful cataract extraction was done, and vision of 20/25 with correction secured. Mr. D. subsequently applied for and secured work as a janitor in the laundry of a large Army hospital near his home, and is reported by the personnel office of that institution to be doing very satisfactory work. The county welfare department visitor commented by letter, "Though we have nothing more sensational to report than the above information regarding his recovery, the fact remains that while just before his eye surgery he could not do even ordinary labor of any kind, today he is supporting himself and his wife while at the same time contributing to the war effort."

H. M. was 12 years old when he came to our attention. His family had paid as private patients for repeated needlings of H's congenital cataracts. After they lost their farm during the depression, however, they could no longer afford private eye care. Through the eye treatment and surgery program H. was enabled to continue under the care of his own ophthalmologist and had another needling. When he suddenly developed a partial detachment of the retina in one eye, authorization was immediately given for re-attachment of the retina, and this operation was successful in restoring sight in the eye to its previous level, 20/100. Consultation has been given the local high school in sight-saving methods which will help meet H.'s needs, and school authorities have co-operated fully in an individualized program in which he is making good progress. His chief vocational interest is in farm work and he is taking the vocational agricultural courses in high school.

The medical social work consultant on a state staff cannot know in detail the individual reactions of the persons receiving service through the prevention of blindness program, as she does when carrying her own caseload in a hospital or clinic. Usually she does not see the person for whom she helps to arrange eye treatment and surgery, or in whose behalf she gives casework consultation to a county welfare department visitor. She is often conscious of the gaps in her knowledge of results of services given. Measuring the amount of service is never easy, but knowledge of even one patient whose sight has been conserved or restored, or one partially sighted child whose educational and social adjustment has been helped, is compensation.

The eye treatment and surgery program of the Division for the

Blind is designed to make available expert services to any person in need of eye care for which he cannot himself pay or which is not available to him through other resources. The primary purpose of the treatment program is to restore and conserve sight. It does not cover care of general conditions such as diabetes, brain tumor, or kidney disease in which the basic cause of difficulty is outside the eye itself. However, it has recently been extended to include treatment of strabismus cases even where the effect of care is primarily cosmetic benefit rather than sight conservation. Requirements as to financial and residence eligibility are sufficiently flexible so that no individual will be deprived of needed care on technicalities alone. It is the purpose of the program to avoid in the future any such case as that reported before the program became widely known in the State. A young man in his late twenties was injured in an accident in the woods when he was struck on the head by a falling tree branch. The next day he noticed some dimness of vision which became progressively worse. However, he did not feel he had sufficient funds to consult an eye specialist and he did not come to the attention of the Division for the Blind until almost four years later, when he was totally blind because of bilateral detachment of the retina. This was too late to permit corrective surgery, and life as a blind person is the only possibility for him.

Community Responsibility

In general, local communities are expected to continue to carry responsibility for eye care for simple refractive errors since resources for this are already available locally in most instances, and the budget of the Division could not cover the cost of simple refractions needed. Where there is any reason to suspect existence of a more serious eye condition, a case may be referred to the Division through one of the county welfare departments, and examination by an ophthalmologist at the expense of the Division authorized.

Eye examination, office treatment, surgery, hospitalization, artificial eyes following enucleation, and in some instances glasses are provided. The actual size of the program has never been very large, and the largest number of patients was cared for in the earlier years of operation, when it was necessary to take care of a backlog

of cases accumulated during the years before an eye care program was established.

When the Division's advisory committee of ophthalmologists set up the program for eye care, their first concern was for adequate standards. This culminated in the fall of 1941 in the requirement that eye surgery done under the program be performed by a physician certified by the American Board of Ophthalmology. This requirement tended to concentrate care in a smaller number of communities in the State, since diplomates of the American Board are resident in only nine cities of the State. However, at no time has there been any great difficulty in arranging transportation for a patient to a city where such an ophthalmologist was available.

In the last biennium for which figures are available, 1941 to 1943, a total of 86 individuals received 106 eye treatments and surgery procedures. These included 31 persons under care for cataract, 21 persons under care for glaucoma, 5 persons under care for strabismus, and 30 persons under care for a variety of other conditions. Thirty-six people received care for conditions in which some improvement or restoration of sight might be anticipated. Of these, final reports showed that after eye surgery 24 had vision above 20/200, 10 had vision not improved to above 20/200 and for 2 reporting was incomplete. Among the 24 are the 2 patients described earlier in this article.

Medical Social Worker in State Eye Program

The place of the medical social worker in eye treatment and surgery in Washington has been in some ways similar to and in some ways different from the job of the medical social worker in an eye clinic or hospital. Cases become known to the medical social worker through correspondence rather than by direct contact, being referred in all instances from the county welfare departments, which are the local units of the State Department of Social Security. The medical social work consultant in the Division is responsible for reviewing applications for care, and securing additional information where necessary, as well as checking financial eligibility on the basis of data submitted by the county. She then submits the report of eye examination with other pertinent documents such as medical social data sheets to the Technical

Consultant of the Division, who makes authorization for eye treatment or surgery. The medical social work consultant then makes arrangements with the county welfare department to see that the authorized care is given by eye physician and hospital. Follow-up procedures are handled by clerical staff in the Division under supervision of the consultant. As seems advisable during the period of care, consultation on medical social aspects of service to patients with eye difficulty is given, primarily through correspondence, but occasionally through direct consultation with the county welfare department staff member and in some instances with the patient when the consultant is in the county. Eye care is thought of always as a part of total service to an individual, and is integrated with such other services as educational adjustment, vocational counselling and training, and social case work service. Through the consultation contact, the county welfare department staff members are helped in understanding general implications of eye disease and steps they can take toward sight conservation, and effort is constantly made to stimulate them to awareness of actual or potential eye difficulties and the importance of making eye care available.

Sight Conservation in the Schools

From the beginning, the staff of the Division has emphasized the sight conservation of school children. In recent years this emphasis has been carried on in close co-operation with the State Departments of Health and Public Instruction, in a most productive three-way relationship. With specialized personnel available, the Division for the Blind has taken a good deal of leadership in statewide programs, some of which have later been carried on by the other departments. Case finding has been recognized as the initial problem in sight conservation of school children. Studies over a period of years finally developed the conclusion that responsibility for case finding of children with eye difficulties must depend primarily on the classroom teacher, who does initial screening with the public health nurse available as an expert for consultation and supervision. This conclusion was reached after it became apparent that there were simply not enough school nurses in the State to assure adequate surveys of school children for possible eye difficulties. Accordingly, the Division for the Blind prepared a pamphlet on "Vision

Testing of School Children" drawing on the best published sources, and using a good deal of the time of the ophthalmologist who is Technical Consultant to the Division. This pamphlet was sponsored jointly by the State Departments of Social Security, Health, and Public Instruction. After its publication, copies were distributed to every public school in the State and to all public health departments so that it might be widely available both to classroom teachers and to school nursing personnel. That it met a real need has been evidenced from comments which have come in to the Division—further experience will indicate the ways in which it can be used most helpfully.

Experience in Washington also brought the conclusion that a case finding program for children with eye difficulties was useless unless accompanied by provision for examination by eye physicians as indicated. Naturally, the majority of school children who are found in the testing program to have symptoms suggestive of eye difficulties will be able to secure this care through financial provision by their own family; however, there will always be a minority of children whose families cannot afford the services of eye specialists. Study in various communities in the State indicated that the chief stumbling block in the case finding program was a satisfactory means of getting a report from the examining eye physician. A new report form to be made available to persons referring school children for examination by an eye physician was therefore worked out by the medical social work consultant and technical consultant, with the advice and comments of the other advisory ophthalmologist. The upper part of this form has space for certain identifiying information and medical history to be filled in by the referring person. The lower half has space for the eye physician's report, and is arranged in check-list form so far as possible.

Sight-saving Classes

Since many of the ophthalmologists in the State have not had experience in working with sight-saving classes, the report form includes a statement of the type of eye difficulty for which sight-saving work is commonly recommended. The form has been made available particularly to the school nurses, who can use it in refer-

ring children to eye physicians for examination, and can then refer the completed form to the appropriate State Department, if sight-saving work is indicated. Various provisions for free eye examinations for children whose parents are financially unable to pay for care have been worked out in different communities in the State, using funds from service clubs, school clinics, Parent-Teachers Associations, etc. Where children have more severe eye difficulties, the eye treatment and surgery program of the Division for the Blind is available. However, this is not used extensively for care of school children, because, in the great majority of cases, their problems are relatively simple, and are taken care of through local community arrangement.

Only the three largest cities in the state—Seattle, Spokane, and Tacoma—have established regular sight-saving classes. The problem of partially sighted children in the rest of the state has therefore been an acute one. The Division has stimulated and participated actively in programs to locate partially sighted children, and to help communities work out an acceptable plan to meet the need of individual children when they are located. Some children from rural or semi-rural districts have been placed in boarding homes in one of the three cities in order to attend sight-saving class, but this procedure has not been followed extensively. Case finding efforts to date have not located numbers of partially sighted children approaching any of the published estimates as to incidence of this type of handicap in the school population nationally. In one county in the state where an active ophthalmologist had advised sight-saving class work for a number of myopic children, rather extensive planning was done with local school authorities for establishment of a sight-saving class, but final steps could not be taken because of lack of availability of a trained teacher and of any classroom, when the town became crowded by war industry population. In another of the more populous counties of the State enough partially sighted children have been located to indicate that a sight-saving class should be established in the near future, and state and local personnel are working toward the objective of setting up such a class.

At the same time that efforts have been carried on to stimulate provision of sight-saving classes in communities having enough partially sighted children to justify that procedure, there has been

recognition of the great need for service to the isolated child with a visual handicap. The method of meeting this need has been through direct consultation to school personnel in the child's own community. Upon request, either directly to the Division for the Blind or to the State Department of Public Instruction, the Medical Social Work Consultant visited a school reporting partially sighted children, after an eye physician's report had been received indicating that the eye condition was such as to warrant sight-saving work. Advice was then given as to physical requirements in the classroom, materials such as stereotyped books, special charts, pencils, paper, and reference lists of other school materials suitable for sight-saving students. Lighting in the classroom was measured by a light meter and suggestions given for window shade equipment, position of children in the rooms, and so on.

During the 1941–1943 biennium school visits were made in 16 of the 39 Washington counties, on behalf of 20 partially sighted children.

One special project carried out by the Medical Social Work Consultant consisted of visits to schools to which partially sighted children were returning from the State School for the Blind. One of these visits was made in company with a staff member of the State Department of Education, and the others alone. These children had been incorrectly placed in the State School for the Blind under an earlier admission policy, and it was recognized that their return to schools in their own community involved a number of problems. In instances where the vision was such that sight-saving materials would be needed, inspection of the school was made by the consultant, and advice given to school personnel on needs of the staff and on sight-saving materials and procedures. These visits usually took the form of consultation with school nurses, supervisory personnel, and classroom teachers in which there was thorough discussion of the child's physical, social, and educational needs. Excellent co-operation was received throughout from the school people and it was felt that sound preparation was made for return of the school child to a more normal educational experience with other sighted children.

The grade placement of children referred has ranged from first grade to third year in senior high school. (In the latter instance,

consultation was ineffective in bringing about adequate adjustment of the student who had so poor a background of being passed from one class to another without adequate learning, because he couldn't read the regular type books, that his handicap could not be overcome through service available).

The prevalence of consolidated schools in the state, and provision of state aid to local school districts has been extremely helpful in getting adequate services to children in rural areas. It was in one of the smaller towns in the state that the consultant first saw schoolroom lighting with photo electric control. She has become something of a missionary on schoolroom lighting, proper window shades, and against glare-producing objects in the classroom. One of the more interesting examples of glare discovered was in a very modern school building situated a few blocks up a hill from one of the larger lakes in the state. The teachers had to keep the blinds pulled on the west windows facing the lake most of the time, because of the degree of reflection from the water.

Until the summer of 1943 this school consultation program for partially sighted children outside of the three largest cities of the state, was a function carried almost exclusively by the Division for the Blind, although we received co-operation from the State Departments of Health and Public Instruction. However, under the new legislation providing for a supervisor of education of the physically handicapped in the State Department of Public Instruction, the function of consultation to schools on classroom problems of the visually handicapped is being transferred to the State Department of Education. A special supervisor on sight-saving work in the State Department of Education has not been appointed nor has there yet been proven a sufficiently large number of children to be served to warrant such a special supervisor, so that responsibility for special planning for our physically handicapped children rests as a co-operative program among the state departments.

Early in the course of the Division's work on eye health of school children, it became apparent that more understanding of this subject needed to get to teachers. It was agreed among the state departments concerned that the wise approach was to bring this contact to teachers in training through the state teacher train-

ing colleges. Accordingly, since 1939, there has been a series of meetings with classes in teacher training colleges to discuss eye health in the classroom; at first the approach was through health education classes, but the most recent consensus of opinion has been that it is wiser to present this material to senior students in practice teaching classes as a part of their consideration of the total health of the child, shortly before they go out into actual teaching jobs. In these meetings with teacher training students a number of different devices have been used. Printed and mimeographed material, including bibliographies and instruction on vision checking in the classrooms, has been distributed; the colored movie on sight conservation produced by the Division for the Blind was frequently shown, and when possible two successive class meetings were arranged, one with an ophthalmologist, the other with the Medical Social Work Consultant, with each discussing the aspect of eye health in the classroom appropriate to his own professional background. The experimentation done to date has been valuable in indicating the most useful approach, and in stimulating joint planning by health, education and welfare in this area. This experience has been pointed up and guided by annual meetings of representatives from the departments concerned and the state teachers' colleges, with representative ophthalmologists in the state participating. Through these aspects of sight conservation work in the Division for the Blind has developed the frequency of infinite productive contact between division personnel and personnel of the State Department of Public Instruction and State Department of Health.

As indicated earlier, an important function of the Medical Social Work Consultant has been to advise visitors in county welfare departments on problems of visual handicap. In staff meetings, when sight conservation was the principal subject for discussion, stress has been laid on early recognition of actual or potential eye difficulties, and ways in which the visitor can help people to utilize medical care. On a case-by-case basis, interpretation has been given on the reaction of the individual to the experience of illness and to physical handicap. Some of this consultation has been through correspondence, some through direct visits—more visits to counties have been in connection with educational

and promotional functions of the Division than in case consultation alone. Another rôle the consultant has occasionally played has been that of integrator of services to meet the needs of a given individual. A case demonstrating this function most vividly is that of D. C.

> D. C. was referred at the age of 13 by the State School for the Blind, where she had been a student for about a year. D. is a diabetic youngster who came from a broken home and who consistently failed to maintain adequate diabetic management. She was an extremely intelligent, alert, and attractive child. Her future health and happiness seemed greatly imperiled by inadequate planning and care at the present. After conference with the State School for the Blind and the county welfare departments concerned, the consultant arranged for D.'s admission to a small treatment center for emotionally disturbed children where medical supervision would also be given. D.'s eye condition, juvenile diabetic cataract, was carefully explained. As a child with very deep-seated emotional difficulties, she remained in this institution for about a year and a half making somewhat fitful progress, but gradually learning a more responsible behavior pattern and to relate more normally to other people, as she overcame reaction to her experience of childhood rejection. She was under the care of an ophthalmologist during her period of case work treatment and had one needling which was quite successful. She attended regular junior high school near the institution, and managed without sight-saving materials or procedures although these were available, if needed. In this instance, her achievement was based on superior intelligence and interest in school work despite limited vision and a diabetic condition which required insulin.

Community Eye Health Education

Another important function of the Division for the Blind since its inception has been a program of community education on sight conservation and prevention of blindness. This has been participated in by all personnel of the Division, with special responsibility resting on the Medical Social Work Consultant. Many types of activities have been carried on. Talks before community groups have been of considerable importance. Such groups have included service clubs, nurses' organizations, Parent-Teacher Associations, community councils, Teachers' Institutes, etc.

Material used in these talks since 1941 has included the color motion picture on sight conservation which was prepared by the Division. Photography was done by a staff member of the State Department of Social Security with considerable experience as an amateur photographer, and the scenario and editing were done in close co-operation with Division personnel, who also assisted in setting up the scenes.

The effectiveness of visual education has been aptly demonstrated by this motion picture, which has been very well received by groups ranging from 6th and 7th grade health education classes to high school students, service clubs, county welfare councils, health and welfare departments, sorority alumni organizations, Junior Womens' Clubs and many other groups. Ultimate values of such efforts at community education are, of course, not easy to judge. They have, however, brought the Division a number of requests for service, and have helped to mobilize an informed public opinion in support of needed legislation.

Legislation

Two achievements in the way of social legislation relate particularly to sight conservation and services to the partially sighted. In 1941 the Legislature passed a bill providing for a serological examination of all expectant mothers during the period of prenatal care. In 1943 a bill provided for the establishment of a division for the education of handicapped children in the State Department of Education, and provided money for hiring the personnel and purchasing special sight-saving material for establishment of a lending service to be used by local schools. The Supervisor of the Division for the Blind was active in the securing of this legislation and in gaining support for it, as well as in planning for its implementation later. All personnel of the Division, as opportunity offered, interpreted the advisability of such legislation to community groups and undoubtedly gained some support for the measure. A supervisor of education for handicapped children was appointed in the Department of Education in August, 1943, and the program is in process of development. Although there had been a good deal of interest in special education or education of

the exceptional child on a statewide level, this was an important step forward.

The other significant piece of legislation relating to sight conservation was a 1943 bill which greatly restricted the sale of fireworks in the state. This was not a complete prohibition of the sale of fireworks, but limited them to the smallest and least hazardous articles. This bill also had statewide support, and while its existence has made less difference during war years when materials for fireworks are hardly available in any case, it will constitute a real measure of protection against eye injury after the war. Previous to the passage of this bill and before the war, several cities in the state had prohibited sale of fireworks, but as roadside stands always sprang up just outside city limits, there was no real control of the sale and use of fireworks.

Summary

The Medical Social Work Consultant's responsibility falls in the two definite fields (1) the surgery and treatment, individual case plan and follow through with the assistance of the county welfare department (2) the prevention of blindness which is a three-way co-operative program among the State Department of Health, the State Department of Education and the State Department of Social Security, Division for the Blind but looking to the Division for the Blind for initial programming and for practical plans and community contacts in bringing to the public knowledge of eye care and preventable blindness.

Industrial First Aid—Eye Injuries

L. Holland Whitney, M.D.
Nassau County, N. Y.

EMPHASIZES the importance of first aid in the maintenance of visual fitness.

DURING the time taken to read this paper, at intervals not exceeding three minutes (and probably a good deal less), one workman after another in some part of this country will have the anguish of a minor or major eye injury. The causative agent will vary. It may be large or small flying objects, a splashing liquid, flying dust or powder, injurious light rays or intense heat. All of these causes will contribute to this macabre parade of pain and disability.

It is probable that the number and severity of ocular injuries as a result of accidents would be far greater than present statistics indicate, were it not for the excellent natural protection with which nature has provided us. The strong bony walled orbital cavities, the protective layer of orbital fat, and the moveable eyelids all serve to provide a maximum of protection for these vitally important organs.

It has been estimated that in this country during 1941, there was an annual loss to employers, employees and the community in which they lived, of approximately $200,000,000. In these war years with the increased tempo of industry generally, the cost of eye accidents has undoubtedly reached a new high. Even more startling is the fact that the overwhelming majority of these are preventable.

It is generally admitted that the number of cases which have been aggravated at the stage when first aid was indicated is unquestionably large. The well-meaning employee, who attempts to

remove a foreign body from the fellow worker's eye with dirty fingers or a soiled handkerchief, is a common example. Such a procedure exposes the victim to dangers which are far greater than those inherent in the foreign body itself. Probably just as serious in terms of later developments are the simple, minor eye injuries which are neglected by the workman completely, until some complication sets in.

The eye problem in industry can be logically and broadly considered under three headings:

1. Determination of the processes in industry where eye protection is required.
2. A corrective-preventive program rather than a post-accident program.
3. Intelligent first aid and medical care where accidents occur in spite of the first two measures.

The industry with which I am associated is engaged in the manufacturing of precision instruments. We have a modern and well equipped foundry and a representative group of machining, assembly and inspection operations. This is considered a light industrial process and as such we should not have an unusually high incidence of eye accidents. Chemicals and solvents are used only as incidentals to the manufacturing procedure.

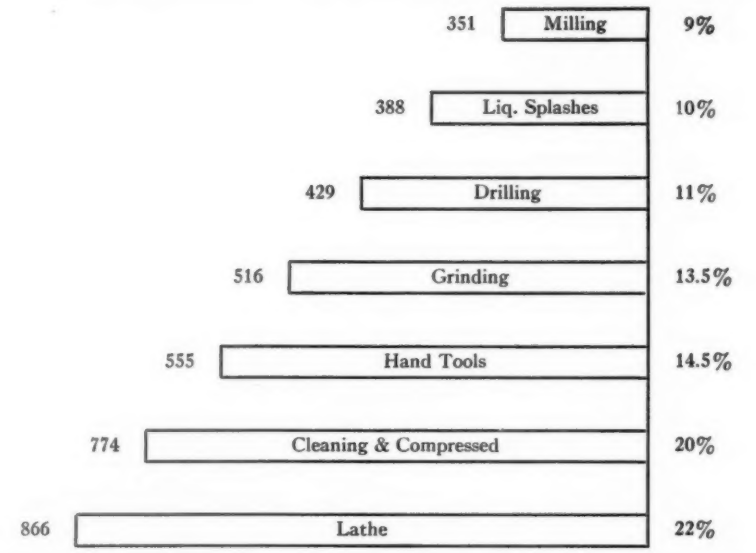
A study of our accident experience, however, does not bear out this theory of low incidence. Hand and finger injuries rank first in order, as would be predicted. Eye accidents are second in frequency, whereas average statistics show that they should be eighth or ninth. National figures indicate that 4 per cent of all injuries happen to the eyes. Approximately 12 per cent of all injuries reported to our plant hospitals are eye injuries. The majority of these occur in machining areas from flying chips. Within this machining area lathe operations are responsible for the largest number, grinding operations second and drilling operations third. The assembly areas are largely responsible for injuries caused by hand tools and liquid splashes. The injuries caused by cleaning with compressed air are chargeable to both machining and assembly departments.

Because of the personal discomfort and pain, and the unfavorable effect on production and costs, we have determined to make a realistic approach to our problem. Thus, we are presently engaged

in an eye protection program. In order to assure ourselves that this will be successful, we have approached the problem through two conventional methods. First, an educational program has been launched, with the full support and backing of the Union and supervisory staff. In this way we hope to secure the understanding

EYE INJURIES

SPERRY GYROSCOPE CO.—Sept., 1943–March, 1944



4,145 EYE—12 per cent of 34,176 TOTAL INJURIES

and co-operation of the employees. Secondly, we have secured a mandatory ruling that all employees and visitors in the foundry and all machining areas must wear safety glasses. This program is still in its infancy. We have high expectations of the efficacy of such an approach.

Industrial medical departments must be set up to handle the emergency treatment of eye injuries. In our company, registered

nurses are in attendance at all times when the plants are in operation. Special instructions are given on the care of eye injuries and accidents, and every nurse employed is competent to render skillful first aid. As in all first aid procedures, it is not only important that the nurse know what to do but also that she realize her limitations. A high percentage of the total number of eye injuries can be adequately managed in this manner.

The industrial physican should have a better-than-average understanding of eye care, and be prepared to handle the more complicated ones. Here too, it is a rule of our company that any major injury must be referred to an outside ophthalmologist for examination and further treatment as necessary. Such a plan protects the physician and the company and assures the employee of the best available care.

The facilities necessary for proper on-the-premises management of eye cases are not complicated or extensive. The usual sterile cotton and gauze, bandages, eye patches and some simple drugs will usually suffice. A binocular loup, foca-lite and an examining table are desirable where any considerable number of foreign bodies are removed. A small syringe with rubber adaptor or a medicine dropper can be used for irrigations. A blunt spud is about the only instrument which is necessary for ordinary use. A lid retractor is useful under some circumstances but is rarely necessary.

The nature of the eye cases which are seen will vary considerably with the type of industry. Generally speaking, almost any type of injury may occur on occasion in almost any plant. The most common types of eye injury are foreign bodies, penetrating and non-penetrating, lacerations and punctures, burns of all types and scalds, and bruises and contusions. Resnick states that in an analysis of over 4,000,000 compensable and non-compensable eye cases, 90 per cent were of the four major types mentioned above.

The greatest problem in first-aid treatment of eye injuries is that of preventing infection. Bacteria are carried on oil, grease, sand and dirt and sometimes even the atmosphere itself. Any wound received in a factory may become infected if it fails to receive prompt and efficient first aid.

Of all injuries occurring to the eye, chemical burns rank first, from the point of importance of immediate treatment or first aid.

In areas of the plant where such accidents are prone to occur, the foreman or leader should be instructed to give immediate first aid before sending the worker to the medical department. This should consist of thorough irrigation of the eye with copious quantities of clean running water. The patient is then sent to the medical department. I am purposely leaving out any further discussion of the first aid treatment or subsequent treatment of chemical burns to the eye. Dr. Carlyle has had extensive experience in this field and will discuss this subject more intelligently than I could hope to do.

With the one exception noted above, first aid at the scene of an accident by fellow employees is forbidden. Almost any other type of eye injury is best sent directly to the plant medical department.

Thermal burns are met with less frequently and are generally less serious than chemical burns. These are usually treated by boric acid irrigation folllowed by the instillation of a bland oil. We frequently use ophthalmic butesin picrate ointment or metycaine and merthiolate ointment.

Lead and solder burns are usually less severe than those caused by molten metals with a higher melting point. The impact of the heated metal may inflict damage which is more serious than the burn. Irregular or jagged particles are likely to traumatize the eye more extensively than smooth, even surfaces. Because of the heated object, thermal burns are usually aseptic. Strict precaution must be observed to maintain this status.

Another type of injury is frequently produced by electric sparks, reflected light rays or welding flames. Here the lesion at first resembles an ordinary burn of the conjunctiva, with the resultant edema and redness. Later effects of these injuries may be cataractous lens changes, corneal scars and even occasionally damage to the retina.

The most common eye injury which we see is the foreign body. These may be divided into two groups—superficial and penetrating. In the first instance, the nurse washes the eye gently with boric acid solution. If this does not remove the offending agent, she will attempt removal with a cotton applicator dipped in boric acid. In the event that this is not successful, the case is referred to the plant physician. An excessive amount of poking or the use of a spud by an

unskilled person is dangerous practice and should be generally condemned.

In the event that the case is referred to the physician, a local anesthetic is usually necessary. We use a 2 per cent Butyn solution and wait about five minutes after it has been instilled before any attempts are made at removal. The patient should be reclining and the physician seated at the head of the examining table with the elbows resting on the table. There is less likelihood of sudden motion or slipping, causing more extensive damage. A good light properly focused, clean hands and sterile instruments are of course all essentials. Occasionally 2 per cent sodium flouriscin solution is used for staining purposes.

After removal, a drop of any of several mild antiseptics is applied, followed later by an ophthalmic ointment and an eye patch. It is important to remember that the worker, who has had a local anesthetic used in his eye, should not be allowed to return to his machine without an eye patch. The patch and periodic application of the ointment is continued until the cornea is healed.

Penetrating foreign bodies, which cannot be removed with reasonable ease, are treated by application of an aqueous local anesthetic, eye patch and bandage and the case referred to a hospital for care by a competent eye specialist. The same routine holds for corneal lacerations and punctures.

We experience seasonable and unpredictable waves of simple conjunctivitis. When there is evidence of purulent discharge, we routinely ask these employees to remain home from work for 3 to 5 days and take active treatment under the care of their own eye physician. There is every reason to believe that such cases are readily communicable and the final effect on production is better where they are isolated from their fellow workers. Simple non-purulent conjunctivitis which is mild in character is treated by irrigations, compresses and mild antiseptics. We often use a combination of zinc sulphate and adrenalin on such cases, with good results.

With the advent of fluorescent lighting, there have been numerous complaints regarding the effect on the eyes. We have no evidence that there is any appreciable or harmful ultra-violet radiation from such equipment. The individuals who feel that they must

wear tinted lenses or have other special considerations are fortunately in the minority.

In summary, I would like to emphasize the need for prompt and skillful management of industrial eye accidents. Certainly such a program made available to all workers in both large and small plants will serve to reduce the tremendous number of eye casualties which are experienced each year. Spreading the gospel of proper first aid for the eyes will unquestionably produce dividends.

I am sure that we are all agreed that the most sound approach to this problem is through eye protection. Most eye accidents are preventable. It would seem logical that our best efforts be directed toward this measure.

The broad field of vision in industry is just beginning to open up. It offers great opportunity to those who will take an active interest and study the special problems which it presents. Perhaps the maintenance of visual fitness and job placement according to visual skills may contribute greatly in the reduction in unnecessary accidents of all kinds. The very fact that you are enrolled in this seminar course indicates that you are aware of this challenge. I sincerely believe that the next decade will produce results in this particular field which may well prove an inspiration to industrial medicine in general.

Note and Comment

Progress in WPB Drive to Improve Visual Conditions in War Plants.—The War Production Board's drive to speed up production through improvement of visual conditions in the war industries has made substantial progress in the three months that it has been under way. To date 7,500 plants have received copies of the *Manual and Appraisal Form on Conservation and Utilization of Eyesight in Industry*, and many have availed themselves of an offer of assistance on problems relating to visual production and safety.

This is a program of the War Production Board, the U. S. Public Health Service, the War Manpower Commission, and the U. S. Department of Labor, Division of Labor Standards, in which the National Society for the Prevention of Blindness is co-operating. Advisory service to the war plants on special eyesight problems and the preparation of informational bulletins are being handled in the Society's offices under the direction of its industrial department.

Evidence of the great need for making such information available is found in an analysis of the first 150 appraisal forms voluntarily returned by plants to the War Production Board. Only 61 per cent of these 150 war industries make the pre-placement vision tests necessary to fit the worker to his job. More than three quarters of the plants where such tests are made fail to have the testing done under the direction of an eye specialist, indicating lack of uniformity and possible inaccuracy.

Other facts revealed in the appraisals include: (1) more than 85 per cent of the plants fail to recheck vision of all employees periodically; (2) more than 80 per cent make no recheck of vision of workers exposed to special hazards; (3) 92 per cent fail to recheck vision of employees with poor production records; (4) 83 per cent do not recheck vision of workers involved in accidents; and (5) 73 per cent make no rechecks where original vision tests disclosed need for follow-up.

Although it is estimated that a worker's personal reading glasses are unsuitable for the job in 19 cases out of 20, of the plants

reporting, 58 per cent indicate that they use the employee's personal reading prescription for work glasses. Only 8 per cent have prescriptions for work glasses written in the plant by a company examiner, although knowledge of job conditions is essential in determining such prescriptions.

Only 49 per cent of the 150 plants making the self-appraisal, maintain illumination to conform to *American Recommended Practice of Industrial Lighting*; 35 per cent say that they do not know whether illumination is up to standard.

Five informational bulletins now available in connection with this WPB program are: *Prescription Lenses for the Job; Screening Tests for Job Vision; Production Gains Through Better Industrial Vision; The Nurse's Part in the Industrial Eyesight Program;* and *Nursing Procedures for Eye Emergencies in Industry.* Single copies of any of these may be had without charge by addressing a request to Dr. Donald B. Keyes, Director, Office of Production Research and Development, War Production Board, Washington 25, D. C.

New Film on Glaucoma.—The National Society for the Prevention of Blindness is planning the production of a new film on the subject of glaucoma, for release sometime in 1945. The film will be a one-reel sound motion picture, for use especially with prevention of blindness workers, nurses, social workers, clinics, glaucoma patients, and the families of glaucoma patients. Readers will have an opportunity to learn further developments on the preparation of the film, through future announcements in the REVIEW.

Social Hygiene Day, February 7, 1945.—Despite wartime restrictions in travel, Social Hygiene Day plans are being carried out through local meetings. The relation of the observance of Social Hygiene Day to prevention of blindness was pointed out by Mrs. Eleanor Brown Merrill, Executive Director of the National Society for the Prevention of Blindness, in a statement urging wide observance of that day on February 7. She said, in part:

> "This annual event helps greatly to arouse public interest and support for the broad objectives of the social hygiene program, and such an educational campaign is of indirect help in the effort to prevent blindness and conserve vision. Syphilis and gonorrhea are among the major destroyers of

sight, being responsible for the blindness of more than 30,000 men, women and children in this country.

"At this time, when there is such a critical shortage of manpower in our war industries and essential civilian occupations, the fight to control syphilis and gonorrhea is more important than ever before. To keep America strong we must take advantage of the scientific advances that can help us control these diseases and safeguard eyesight."

Institute on Vision Conservation.—The National Society for the Prevention of Blindness announces that Miss Eleanor W. Mumford, R.N., Associate for Nursing Activities, is to have charge of a three-weeks Institute on Vision Conservation on the Los Angeles campus of the University of California. With the collaboration of the Society, this Institute will be given as a part of the 1945 Summer Session of the University, open to public health nurses, industrial nurses, and teachers interested in special study in this area, and will carry three units of University credit toward special education teaching credentials and elective credit in the public health nursing curriculum.

The services of Dr. W. Morton Gardner, an ophthalmologist long prominent in the school eye health program of Los Angeles, have been obtained by the University to present the scientific basis for Principles of Vision Conservation. Miss Mumford will give the practical application of these principles and teach techniques in Vision Conservation. Further information on the course can be obtained by writing to Dr. J. Harold Williams, Director of Summer Sessions, University of California, 405 Hilgard Avenue, Los Angeles 24, California.

Current Articles of Interest

Industrial Injuries of the Eye, Elbert S. Sherman, M.D., *Archives of Ophthalmology,* July, 1944, published monthly by the American Medical Association, 535 N. Dearborn Street, Chicago 10.

Dr. Sherman, who has practiced for many years in the center of a large industrial district, advises ophthalmologists concerning features of compensation, an element in industrial practice which is not popular with some ophthalmologists because of the necessity for elaborate reports and because of the importance of evaluating the extent of final vision loss, which is often difficult to evaluate without observation over a period of time. Dr. Sherman stresses that reports should be prepared to be read by the layman, and at the same time very definite information must be given.

Penicillin in Ophthalmology, J. G. Milner, F.R.C.S., Squadron Leader, R.A.F.V.R., *British Medical Journal,* August 5, 1944, published weekly by British Medical Association, Tavistock Square, London, W.C.

On the basis of 144 Service cases, handled within three months, Milner reports that penicillin drops (500 units per c.cm.) appeared to retain potency for four hours, ointment (100 units per gramme) for six hours. Good results were obtained in blepharitis, acute conjunctivitis, and corneal ulcers (infective); it is also apparently effective in chronic dacryocystitis, recurrent styes and infected cholazion. Indications for its use are: (1) very serious injury to the eye, whether penetrating or not; (2) any facial burn involving the eye; (3) routine post-operative treatment. Conditions in which penicillin appears of doubtful or no value include chronic conjunctivitis, episcleritis, trachoma, phylctenular keratitis, marginal ulceration, herpetic keratitis, etc. Yet even in these cases, where a secondary, penicillin-sensitive organism is also present, healing may be indirectly abetted by the administration of the drug.

A Quantitative Test for Measuring Degree of Red-Green Color Deficiency, Louise L. Sloan, Ph.D., *American Journal of Ophthal-*

mology, September, 1944, published monthly by the Ophthalmic Publishing Company, 837 Carew Tower, Cincinnati.

The Color-Threshold Tester, which is designed to measure ability to distinguish colored lights of low intensity and subtending small visual angles, is described in its physical aspects, conditions and procedure of administration, and method of scoring. To determine the validity of the Tester, 100 subjects were given also five other color-vision tests. Scores were arranged into intervals containing approximately the same number of individuals, and a high correlation with each of the other five types was evident. The conclusion of the author is that persons with marked inability to distinguish colored lights of low intensity will *probably* also show poor ability in other tasks requiring color discrimination, but recommends that the color-vision test chosen for the selection of aircrew personnel should be that which correlates most closely with practical field tests related to their special tasks.

Trachoma in London: The End of a Chapter, Arnold Sorsby, M.D., F.R.C.S., *British Medical Journal*, August 12, 1944, published weekly by the British Medical Association, Tavistock Square, London, W.C.

On May 10, 1944, the trachoma block at White Oak Hospital, Swanley, was closed, symbolizing the end of trachoma's epidemic existence among London's children, which has existed since the first half of the last century, when it spread among the children under the care of the Poor Law authorities. Observance of rigid isolation quickly met the situation, and has proven that making trachoma a reportable disease and enforcing isolation will be the way to cope with the incidence among the adult population.

Prophylactic Value of Sulfathiazole Against Neonatal Gonococcic Conjunctivitis, Morris Gleich, M.D., Marvin L. Blumberg, M.D. and Alvin S. Mason, Jr., M.D., *American Journal of Diseases of Children*, June, 1944, published monthly by the American Medical Association, 535 N. Dearborn Street, Chicago 10.

Since incidence of ophthalmia neonatorum continues despite silver nitrate requirements in 46 States, a thirteen-month study was conducted at Harlem Hospital, New York City. Results

showed that oral administration of sulfathiazole in a total dose of 20 grains in three days, starting 12 hours after birth, is effective. It is suggested that this drug dosage be administered routinely as an adjunct to the instillation of silver nitrate.

1. Epidemic Keratoconjunctivitis, Robert F. Korns, M.D., Dr.P.H., F.A.P.H.A., Major M. Sanders, M.C., A.U.S. and R. C. Alexander, *American Journal of Public Health*, June, 1944, published monthly by the American Public Health Association, 1790 Broadway, New York 19.

2. Epidemic Keratoconjunctivitis—Detroit Experience, Joseph G. Molner, M.D., F.A.P.H.A. and E. L. Cooper, M.D., in *ibid.*

The first article presents evidence, from sera of epidemic keratoconjunctivitis cases and their contacts, supporting the opinion that the virus isolated by Sanders is etiologically related to the disease. The second suggests two steps in controlling the disease: (a) making it reportable; (b) inaugurating communicable disease technique in the eye clinics of industrial plants. It also relates the apparent therapeutic value of tyrothricin, as evidenced in a study of Detroit cases.

Physical Impairments in Low-Income Farm Families, Mary Gower and Jesse B. Yaukey, *Public Health Reports*, September 8, 1944, published weekly by the U. S. Public Health Service.

During the past nine years the Farm Security Administration has been engaged in rehabilitation of low-income farmers with insufficient collateral to borrow from banks. It was found that successful rehabilitation necessitated attention also to their health and physical condition. Data for the present report was gathered during 1939–40, from 19 counties over the country, whose population consisted mainly of native whites and Negroes.

Summary of findings of vision defects by the authors reads: "Curves of the age prevalence of defective vision as determined by the Snellen test are presented for this group and compared with other available data. The relative age prevalence of defective vision among rural rehabilitation farmers agrees with that of farmers examined by the Life Extension Institute, and differs from that of urban groups examined, in a less rapid rate of increase in

young adult ages and a more rapid rate of increase between 40 and 50 years of age. With respect to the actual value of recorded prevalence rates, the F.S.A. borrower families have less defective vision as determined by the Snellen test than available examined urban groups especially between the ages of 20 and 45 years; they also compare somewhat favorably with another examined agricultural group, but it is impossible to say how much of this difference might be due to differences in group selection and examining procedure.

"Sex and color comparisons show that females have a higher percentage of defective vision than males for every age group; Negroes in these data have less defective vision than whites for all age groups."

Book Reviews

CLAREMONT COLLEGES READING CONFERENCE, NINTH YEARBOOK 1944. Claremont, Calif.: Claremont Colleges Library. 168 p.

Anyone interested in the teaching of reading, who has not been convinced that reading difficulties can seldom be traced to one simple cause, will find much food for thought in the Ninth Yearbook of the Claremont Colleges Reading Conference. This Conference aims to give consideration to a much broader concept of the nature of the reading process than is found in programs treating only a limited portion of the field.

Naturally, the Report re-emphasizes the fact that a careful study must be made of the learner's physical condition, his intellectual capabilities, his social and emotional nature, and also of the influences from without that may affect his development. The contributors reiterate that although intelligence is perhaps the major factor in school success "the physical machine should be put into running order as a prerequisite for satisfactory adjustment of that machine." Therefore they devote much discussion to the possible effects on the reading program, of visual, auditory and speech difficulties.

One contributor brings out the fact that although seeing is a native ability, efficient seeing must be learned. Since visual education means a full development of visual abilities, consideration must be given, among other aspects, to the relationship between binocular co-ordination and school success, and the effectiveness of orthoptic training when reading difficulties indicate a need for such.

Other contributors recommend that visual speech reading supplement aural speech reading, for those who have suffered aural impairment, and indicate the value of the use of auditory stimulation in the speech program.

The discussion of nutrition in its relation to school success points to the often-forgotten part that food plays in providing the energy required for reading, in whatever form it takes.

The Report has emphasized the fact that much remedial reading

might be avoided if expert service is given in laying the foundation of a reading program, through intensive study not only of the learner but of the tools with which both teacher and pupil must work.

Recognition of the competition of the school program with comics, radio presentations, etc., leads to suggestions for the better programs and materials for pupils of all ages by capitalizing on their individual interests, by developing audio-visual education as a possible substitution for programs centered exclusively upon printed textbooks.

The part that language plays in international relationships is exceedingly timely, and naturally leads to the desirability of teaching students to read and to speak foreign languages. One contributor suggests that since "we are usually down on the things we are not up on," the ability to converse freely and with facility is a basic preventive for misunderstanding.

The breadth of material offered in this Conference is indicated by the list of those who contributed papers. This includes not only those whose interest in the subject is taken for granted—school administrators, college professors, teachers, psychologists, parents, librarians and publishers—but a director of the Urban League, a representative of the National Safety Council, and a lieutenant of the U. S. Navy, whose excellent contribution, "Reading Problems of Technical Training in the Navy Air Force," brought to the Conference the significance of the problems facing those who prepare men and women for war work.

Fortunate indeed are those who could attend this Conference, for those who could not, the well-presented report of the proceedings serves not only as a recompense, but as an example of what the Conference itself demonstrated: the importance of the ability to read.

—WINIFRED HATHAWAY

BUILDING A POPULAR MOVEMENT: A Case Study of the Public Relations of the Boy Scouts of America. Harold P. Levy, Department of Social Work Interpretation, Russell Sage Foundation, New York, N.Y. 1944. 165 p.

This analysis of the efforts of the Boy Scouts organization to create and maintain popular understanding and good will should

be of interest to all who are engaged in public relations activities. In addition to promoting Boy Scout sequences in commercial movies, both dramatic and newsreel, the Scouts have built up their own library of non-commercial motion pictures for sale or rent to local councils; they are also carrying on an extensive program of broadcasting, newspaper publicity and exhibits.

Mr. Levy is Research Associate in the Russell Sage Foundation's Department of Social Work Interpretation, directed by Mrs. Mary Swain Routzahn. In an introduction, Mrs. Routzahn comments: "Public relations work is widely accepted as an essential accompaniment to any public service. So far, however, many agencies are unable or reluctant to seek funds to provide for necessary staffs and materials."

—DAVID RESNICK

Briefer Comment

REHABILITATION OF THE WAR INJURED. William Brown Doherty, M.D. and Dagobert D. Runes, M.D., Eds. New York: Philosophical Library, 1943. 684 p.

This symposium on medical and psychological treatment of war casualties contains two chapters on eye injuries: "Rehabilitation in Non-recoverable Eye Cases," and "Rehabilitation in Ophthalmic Cases." The former recommends rehabilitation in a blind environment, as producing a more encouraging mental state; where neither too much, nor too little, is done for the patient. The philosophy and chronology of treatment at St. Dunstan's, where the author of this chapter (R. C. Davenport, F.R.C.S.) is Medical Officer, is outlined. The latter chapter, by Lady Duke-Elder, outlines rehabilitation of recoverable cases involving the loss of one eye or occurrence of acute muscular imbalance, and of patients convalescing from an ocular disease or injury. Also included are two chapters on the legal aspects of rehabilitation and compensation.

Contributors to This Issue

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